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Session SC05 - Magnetoresistance IX: Tunnelling and Transport in Manganites.
ORAL session, Wednesday afternoon, March 24
Room 367W, GWCC

[SC05.03] Magnetic percolation and giant spontaneous Hall effect in La 1-xA xCoO 3 (A = Ca, Sr, 0.1 \le x \le 0.5)

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The spontaneous Hall effect and magnetoresistance (\Delta R_H) of La_1-xA_xCoO_3 (A = Ca, Sr) are investigated as a function of the doping level x. We find that the Hall resistivity \rho _xy of the ferromagentic cobaltites at T < T_Curie is proportional to the magnetization M of the sample, and that for both La_1-xCa_xCoO_3 and La_1-xSr_xCoO_3, the spontaneous Hall coefficient R_s(\equiv \rho_xy/M) is a strong function of the temperature T and the doping level, reaching maximum slightly below T_Curie for each doping level, and achieving the largest magnitude near the magnetic percolation threshold x \sim 0.2. In the case of La_0.8Ca_0.2CoO_3, we obtain a record value of R_s \approx 1400 x 10^-9 m^3/C, exceeding all spontaneous Hall coefficients of known single-phased ferromagnets. In contrast, the longitudinal resistivity of these cobaltites decreases monotonically with increasing magnetic field for all samples, except La_0.8Ca_0.2CoO_3 that exhibits non-monotonic dependence. The giant spontaneous Hall effect may be attributed to the enhanced spin fluctuations near T_Curie, and the strong spin-orbit scattering from percolating high-spin Co^3+ - Co^4+ conducting clusters in a low-spin Co^III non-conducting matrix. Possible correlation between \Delta R_H and \rho _xy will be discussed.

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